VIF/SIF signal processor
BA7356S

The BA7356S is a multi-format (M, B/G, D/F, and I) VIF/SIF signal processor for television and VCR applications. It features a built-in sound-trap and band-pass filters, and employs a pulse-count audio detector that does not require adjustment. This IC reduces external component requirements, and allows space savings.

●Applications

TVs and VCRs

●Features

1)Separate-carrier PLL with full synchronous detection. Excellent DG/DP, CS beat (920kHz) and cross color. In addition, by pulling down the SIF input (pin 9) it can be used as an intercarrier.

2)The IF AGC time constant is dual-layered to allow faster speeds.

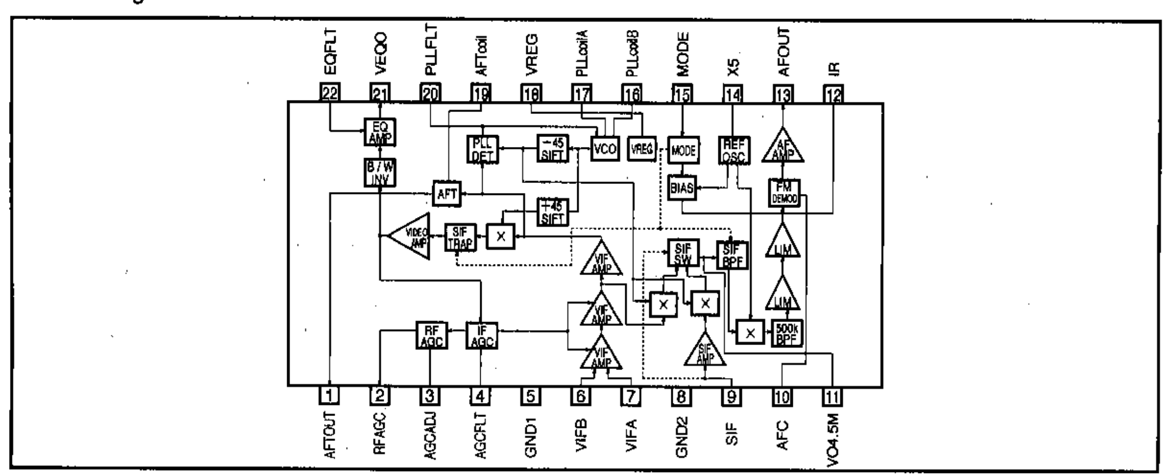
3)The variable-gain amplifier has excellent linearity to ensure low distortion, and AGC variance and temperature drift have been minimized.

4)Built-in SOUND filter (SOUND trap and SOUND BPF). The MODE switch can be used to switch between M, B/G, I, and D/K (4.5MHz, 5.5MHz, 6.0MHz, and 6.5MHz respectively). In particular, the SOUND BPF gives a larger attenuation ratio than conventional discrete circuits by using two-layer SIF+500kHz BPFs.

5)The audio detector uses a 500kHz BEAT DOWN pulsecounter detector that does not require adjustment. This eliminates the need for a detector coil and gives better linearity and S/N.

6)Useofpulse-counterdetectionandthebuilt-inSOUND filter means fewer pins, external components and adjustment locations are required. The IC is available in a 22-pin SDIP package and will enable cost and space savings.

●Block diagram



ROHM

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Applied voltage	$V_{CCMax.}$	10.5 *1	V
Power dissipation	$Pd_{Max.}$	1250 *2	mW
Operating temperature	Topr	−15 ~65	℃
Storage temperature	Tstg	−40 ~150	℃
Pin 2 input voltage	$V_{P2Max.}$	10.5	V

*1 27 Ω resistor connected between VCC and VREG.
*2 When IC is stand alone, reduced by 12.5mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Limits	Unit
Power supply voltage (9V)	$V_{CC\,9V}$	8.8~9.2 *1	V
Power supply voltage (12V)	$V_{CC\,12V}$	11.7 ~12.3 *2	V

*1 27 Ω resistor connected between VCC and VREG.
*2 62 Ω resistor connected between VCC and VREG.

●Pin description

Pin No.	Pin Name	IN / OUT	Standard voltage	Equivalent circuit	Function
1	AF - TOUT	OUT	—	Vcc, 500, 1k, 1, 500, GND	AFT output. VREG/GND push-pull output.
2	RF - AGC	OUT	—	Vcc, 4k, 2, GND	RF-AGC output. Open-collector output. Gain can be set using an external resistor (minimum value of the maximum sink current of pin 2 is 0.7mA). Keep the pin 2 voltage at 10.5V or less.
3	AGC - ADJ	—	2.1V (when 100kΩ resistor connected)	Vcc, 4.5k, 4k, 1k, 3, 14.7k, GND	RF-AGC delay point adjustment. Connect to GND via a variable resistor (approx. 100kΩ).
4	AGC - FLT	—	5.0V	Vcc, 400, 4, GND	For filter time constant for VIF AGC.
5	GND1		0V		GND for VIF, AGC and AFT.

Pin No.	Pin Name	IN / OUT	Standard voltage	Equivalent circuit	Function
6 7	VIFB VIFA	IN	4.2V		Video IF input. Use with balanced input.
8	GND2	—	0V		SIF and PLL GND.
9	SIF	IN	6.6V		Audio IF input. Can set to intercarrier mode by pulling down via a 2kΩ resistor.
10	AFC	—	2.7V		Holding the audio output DC level fixed. Connect to GND via a 4.7 μF capacitor and to VREG via a 10 μF capacitor to reduce buzz. Set this pin to 0.3V or lower to apply audio/video mute.
11	VO - 4.5M	—	5.2V		2nd SIF output. Connect a trap to this pin to vary the sound filter characteristics. The internal impedance is a high 1kΩ, so connect a buffer to output.
12	IR	—	2.4V		Reference current source for adjusting the internal filter. Use connected to GND via a 24kΩ resistor. Use an accurate resistor with good temperature characteristics (e.g. ±1% metal film).
13	AFOUT	OUT	3.2V		Audio signal output. The standard output in the case of B/G is 520mVrms (when f = 50kHz). Connect to GND via a 10kΩ resistor.

Pin No.	Pin Name	IN / OUT	Standard voltage	Equivalent circuit	Function
14	X5	—	5.0V		For connection to a 5MHz oscillator (when M format is used). Use as a reference oscillator for automatic adjustment of the internal filter, and as the signal for the SIF signal low frequency conversion. (B/G, D/K format: 6MHz, I format: 6.5MHz).
15	MODE	IN	3.4V		Input Trap Filter switch. 0V: M format (4.5MHz) 2.4V: D/K format (6.5MHz) 4.3V: I format (6.0MHz) VREG: B/G format (5.5MHz)
16 17	PLL - COILA PLL - COILB	—	3.6V		For connection of IF detector VCO oscillator coil.
18	VREG	—	6.6V		IF circuit power supply. Pin 18 has a built-in shunt regulator.
19	AFT - COIL	—	3.0V		For connection of AFT coil. To apply AFT defeat, connect to GND via a 1kΩ (approx.) resistor.
20	PLL - FLT	—	3.4V		Time constant circuit for the PLL filter.
21	VEQO	OUT	2.0V (SYNC)		VIDEO output. Output is via the sound trap, B/W noise inverter, and EQ AMP. Connect to GND via a 4.7kΩ resistor.
22	EQFLT	—	5.2V		EQ Filter. Connect to GND via an LCR series resonant circuit. R should be ≧1kΩ.

* Vcc and Vcc2 in the equivalent circuit diagrams are connected to the VREG pin (pin 18).

●Electrical characteristics (Unless otherwise specified Ta=25℃, V_{CC}=9V, and P=38.9MHz)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
(VREG)							
Circuit current		I_{CC}	—	92	105	mA	
Regulated voltage		V_{REG}	6.2	6.6	7.0	V	
(VIF)							
Input sensitivity		$V_{VMin.}$	38	43	48	dBμ	V_{VO} = -3dB point
Maximum allowable input level		$V_{VMax.}$	100	110	—	dBμ	V_{VO} = +1dB point
AGC range		GR	62	66	—	dB	V_{VO} = ±3dB range
Quiescent video output voltage		V_{P21}	3.9	4.3	4.7	V	No signal, V_{P4} = V_{REG}
Video detector output level		V_{VO}	1.7	2.0	2.4	$V_{P\text{-}P}$	V_I=80dBμ, AM87.5%MOD 100% white video signal
Synchronous signal tip voltage		V_{P21SY}	1.7	2.0	2.3	V	
Video output DG		DG	—	2	8	%	V_I=80dBμ, AM87.5%MOD 3STEP video signal
Video output DP		DP	—	3	8	deg	
Sound Trap attenuation	M, B / G	G_{VOS}	33	45	—	dB	20∗LOG (VOS / VO0.2M)
	D / K, I		28	45	—		
920kHz beat level		I_{920}	37	44	—	dB	P=0, P / C=4, P / S=14dB
Video output S/N		S / N_V	47	53	—	dB	V_I = 90dBμ, 100% white
White noise threshold voltage		V_{WTH}	4.7	5.0	5.3	V	CW = 70dBμ frequency variation and pin 21 voltage variation
White noise clamp voltage		V_{WCL}	2.9	3.2	3.5	V	
Black noise threshold voltage		V_{BTH}	1.1	1.4	1.7	V	
Black noise clamp voltage		V_{BCL}	2.6	2.9	3.2	V	
RFAGC maximum sink current		I_{P2SI}	0.7	1.2	—	mA	CW=100dBμ, AGCADJ=100k
(AFT)							
Maximum AFT voltage		$V_{P1Max.}$	6.0	6.4	—	V	CW=38.4MHz
Minimum AFT voltage		$V_{P1Min.}$	—	0.3	0.8	V	CW=39.4MHz
AFT detection sensitivity		S_I	35	50	—	mV / kHz	CW frequency variation
AFT defeat starting voltage		V_{AFTDET}	—	—	1.2	V	CW=38.4MHz
AFT defeat voltage		V_{1DEF}	2.9	3.3	3.6	V	CW=38.4MHz
(PLL)							
PLL capture range 1		f_{CU}	0.6	+1.2	—	MHz	CW = 80dBμ frequency variation
PLL capture range 2		f_{CL}	—	−1.2	−0.6	MHz	
PLL lock range 1		f_{LU}	0.6	+1.3	—	MHz	
PLL lock range 2		f_{LL}	—	−1.3	−0.6	MHz	
VCO control sensitivity		β	0.5	1.0	—	kHz / mV	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
(SIF)						P=38.9M/80dBμ S=33.4M/70dBμ
Input sensitivity	$V_{SMin.}$	—	24	39	dB μ	fm=400Hz, Δf=50kHz
SIF maximum allowable input level	$V_{SMax.}$	80	90	—	dB μ	5% distortion
FM detector output level	V_{SO}	350	520	700	mVrms	fm=400Hz, Δf=50kHz
Audio output S/N	SN_{AF}	52	64	—	dB	fm=400Hz, Δf=50kHz
Audio output distortion	THD	—	0.3	1.5	%	fm=400Hz, Δf=50kHz
AMR	AMR	40	50	—	dB	Δf=25kHz, AM30%
MUTE video output voltage	V_{VMUTE}	—	0.7	1.2	V	V_{P10}=GND
MUTE audio output voltage	V_{SMUTE}	2.3	2.9	3.5	V	V_{P10}=GND
MUTE start voltage	V_{10MUTE}	—	—	0.3	V	
Intermode switch voltage	V_{9INT}	0.1	—	1.0	V	
(MODE)						
MODE voltage range (M)	V_{15M}	—	0	0.5	V	REF - OSC=5MHz
MODE voltage range (B/G)	V_{15BG}	6.0	V_{REG}	—	V	REF - OSC=6MHz
MODE voltage range (D/K)	V_{15DK}	2.20	2.40	2.60	V	REF - OSC=6MHz
MODE voltage range (I)	V_{15I}	4.10	4.30	4.50	V	REF - OSC=6.5MHz

◎Not designed for radiation resistance.

●Measurement circuit

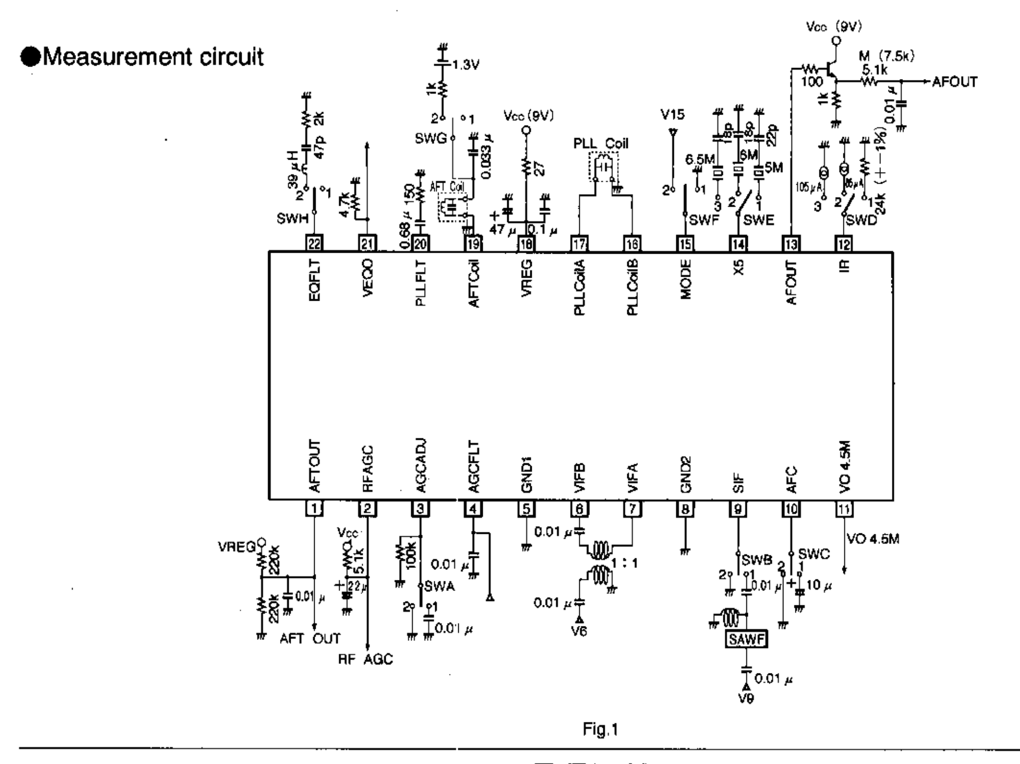
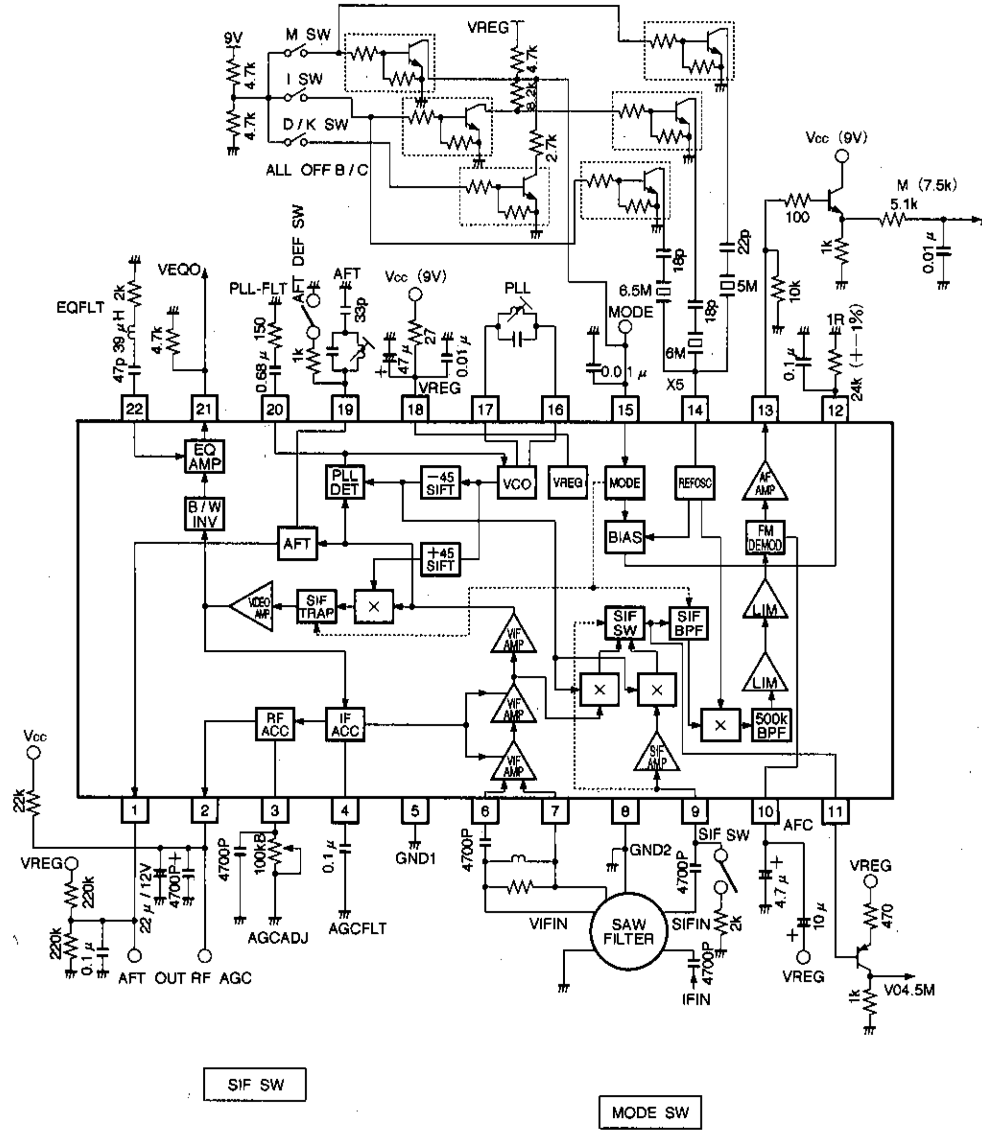


Fig.1

●Application example



SPLIT=FREE / INTER=GND
SIF IN [9pin] DC

STANDARD	M	B / G	D / K	I
V / S C SPACING [MHz]	4.5	5.5	6.5	6.0
MODE [V]	0	6.6	2.4	4.3
OSC [MHz]	5.0	6.0	6.0	6.5

AT VREG=6.6V

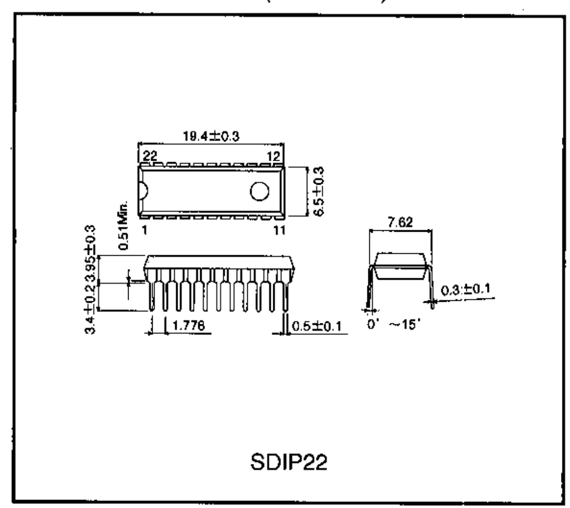
Fig.2

●Operation notes

- Simultaneous audio and video output muting function
  It is possible to simultaneously mute the audio and video output by pulling the AFC filter pin down.
- AFT defeat function
  AFT defeat can be applied by pulling the AFT coil pin down via a 1kΩ resistor.
- Recommended SIF input range for intercarrier mode
  P/S=20 to 30dB (including SAW-FILTER).
- IF input range for RF-AGC switching
  60 to 95dB μ.
- Intercarrier mode switching
  Intercarrier mode can be set by pulling the SIF pin down via a 2kΩ resistor.
- IR pin external resistor
  This resistor sets the filter system reference current, so use an accurate component that has good temperature characteristics.
- Adjustment of the evaluation board
  Before performing measurements, adjust the coils as described below.

1. VCO coil
   Lower the VIF input level, and apply a voltage of AGCFLT=6V. Monitor the PLL-FIL voltage (V1). Next, input a signal of VIFIN=80dB μ, 38.9MHz, and with the AGCFLT free, adjust the VCO so that the voltage at this time, V2, becomes the same as V1.
2. AFT coil
   Input a signal of VIFIN=80dB μ, 38.9MHz, set the AFT defeat switch to open, and monitor the AFT output pin voltage. Rotate the AFT coil, adjust the output voltage to 1/2VREG (Typ. 3.3V) at the point where the output voltage changes steeply.

●External dimensions (Units: mm)



SDIP22